UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/584,796	06/01/2000	Fredrik Lindqvist	1410-679	4990

7590 05/26/2004	**EXAMINER**
Nixon & Vanderhye PC	JAMAL, ALEXANDER
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ART UNIT	PAPER NUMBER
2643	

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DATE MAILED: 05/26/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

— The MAILING DATE of this communication appears on the cover sheet with the correspondence address —

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE _3_ MONTH(S) FROM
THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed
  after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
  Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any
  earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on _02 March 2004_.

2a)☒ This action is **FINAL.**   2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is
closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) _1-44_ is/are pending in the application.

    4a) Of the above claim(s) _2 and 8_ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) _1,3-7,9-44_ is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

    Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

    Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

    a)☐ All   b)☐ Some * c)☐ None of:

      1.☐ Certified copies of the priority documents have been received.

      2.☐ Certified copies of the priority documents have been received in Application No. _____.

      3.☐ Copies of the certified copies of the priority documents have been received in this National Stage
application from the International Bureau (PCT Rule 17.2(a)).

    * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1)☒ Notice of References Cited (PTO-892)

2)☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3)☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
    Paper No(s)/Mail Date _____.

4)☐ Interview Summary (PTO-413)
    Paper No(s)/Mail Date. _____.

5)☐ Notice of Informal Patent Application (PTO-152)

6)☐ Other: _____.

DETAILED ACTION

Response to Amendment

1.   Based upon the submitted amendments (March 2, 2004), examiner withdraws objections

from the prior office action (October 30, 2003) to the specification.

2.   Examiner acknowledges that claims 2 and 8 have been cancelled.

3.   Applicant's arguments with respect to claims 1-44 have been considered but are moot in

view of the new ground(s) of rejection.

Claim Rejections - 35 USC § 112

4.   The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making
> and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it
> pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode
> contemplated by the inventor of carrying out his invention.

5.   Claim 29 rejected under 35 U.S.C. 112, first paragraph, as based on a disclosure which is

not enabling. The domain of the received signal is critical or essential to the practice of the

invention, but not included in the claim(s) is not enabled by the disclosure. See *In re Mayhew*,

527 F.2d 1229, 188 USPQ 356 (CCPA 1976). Claim 29 depends from claim 20, and claim 20

specifies a 'tranceiver canceling an echo from received signal in the **frequency** domain...'.

Claim 29 states canceling the echo from the received signal in the time domain. The

specification does not disclose a single embodiment of the invention that cancels an echo

estimate from the received signal in both the time and frequency domains.

6.   The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

7.   **Claim 10** rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing

to particularly point out and distinctly claim the subject matter which applicant regards as the

invention.

Claim 10 recites the limitation "echo canceller" in claim 2. There is insufficient

antecedent basis for this limitation in the claim. Claim 2 has been cancelled.

Claim Rejections - 35 USC § 103

8.   The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all

obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

9.   **Claims 1,3-7,9-17,20-43,** rejected under 35 U.S.C. 103(a) as being unpatentable over Ho

et al. (5317596), and further in view of Dowling (6597745).

As per **claim 1,** Ho discloses an echo canceller used in a transceiver

(ABSTRACT). The device comprises electronic circuitry configured to estimate and

remove echo signals in the frequency domain (Fig. 3 Col 5 line 65 to Col 6 line 22).

However, Ho does not disclose that the echo signals are estimated with a combination of both a product of a first matrix and transmitted symbol and a product of a second matrix and a previously transmitted symbol.

Dowling teaches an adaptive precoder that enables a block oriented receiver to recover a datastream in the presence of ISI and noise (ABSTRACT) that will reduce computational complexity over previous implementations (Col 2 lines 40-55). He further suggests that the precoder may be implemented in (merged with) an echo canceller (Col 22 lines 1-17). The precoder detects and compensates for noise (and ISI) in the signal using a combination of both a product of a first matrix and transmitted symbol and a product of a second matrix and a previously transmitted symbol (Fig. 5 Col 17 lines23-65). It would have been obvious to one of ordinary skill in the art at the time of this application to implement the precoder's functionality with Ho's echo canceller to produce an echo signal (in the frequency domain) for the advantage that the precoder (and as such, the echo canceller) takes into account ISI and ICI (noise) and provides reduced computational complexity.

As per claims 12,24,37,38, claims rejected for same reasons as claim 1. Additionally, Dowling discloses that the input signal vector may be multiplied with a column vector (Col 9 lines 15-55).

As per **claims 20,30,35**, claims rejected for same reasons as rejection of claim 1. Additionally, Dowling discloses that the precoder takes into account the effects of ICI (Col 8 lines 60-67).

As per **claims 3,13,26,32,43**, Dowling discloses that the input vector (and as such, the delayed vector) is hermitian-symmetric and is divided into real and imaginary parts (the imaginary parts are ignored) before matrix processing (Col 9 line 15 to Col 10 line 5).

As per **claims 4,5,22,31**, the first matrix (DOWLING: Figs 3,5) has coefficients that represent how an echo from a currently transmitted signal affects a received signal, and the second Matrix (DOWLING: Figs 4,5) represents how an echo from a previously transmitted signal affects the received signal.

As per **claims 6,7,34,36**, Ho discloses that the circuitry adapts the echo canceller coefficients (coefficients of the matrices) using a difference between the receive signal and the echo estimate signal using an lms algorithm (device 58, Fig. 3, Col 6 lines 50-62).

As per **claim 9**, Dowling discloses that the device may be implemented in a DMT transceiver (ABSTRACT).

As per **claim 10**, Dowling discloses that the Matrices may be NxN matrices (Col 7 lines 30-50).

As per **claims 11,33,42**, Dowling discloses that the device will function for a vector communication signal (which inherently includes, by definition, the transmit,

receive, and echo estimate signals) such as a DMT system with Hermitian symmetric

signal points (Col 2 lines 58-67).

As per claims 14,15,23, Dowling discloses a compensation (twiddle) factor

(applied to both matrices) to compensate the previously transmitted signal that is a

complex exponential term (Col 11 line 53 to Col 12 line 25, Col 14 lines 5-15). The

twiddle factor is also applied to the triangular submatrix formed to compensate for a

cyclic prefix (Col 20 lines 49-60). Dowling also discloses the device is used in a DMT

type transceiver (ABSTRACT).

As per claims 16, 17,27,28,40,41, Ho discloses that for applications involving

asymmetric data, the signal should be decimated or interpolated as appropriate (Col 7

lines 49-62).

As per claim 21, claim rejected for same reasons as rejections of claims 1 and 9.

As per claim 25,39, the matrix is combined with a difference between the current

transmit signal and the product of the delayed signal (previously transmitted) and the

compensating factor in the matrix (as per rejection of claim 14) (DOWLING: Fig. 5).

10.   Claims 18,19 rejected under 35 U.S.C. 103(a) as being unpatentable over Chaffee et al.

(5117418), and further in view of Dowling (6597745).

As per claim 18, Chaffee discloses an echo canceller used in a transceiver

(ABSTRACT). The device comprises electronic circuitry configured to estimate echo

signals in the frequency domain, convert the estimate to the time-domain, then subtract

the estimate in the time domain (Col 3 line 5 to Col 4 line 10). However, Chaffee does

not disclose that the echo signals are estimated with a combination of both a product of a

first matrix and transmitted symbol and a product of a second matrix and a previously

transmitted symbol.

Dowling teaches an adaptive precoder that enables a block oriented receiver to

recover a datastream in the presence of ISI and noise (ABSTRACT) that will reduce

computational complexity over previous implementations (Col 2 lines 40-55). He further

suggests that the precoder may be implemented in (merged with) an echo canceller (Col

22 lines 1-17). The precoder detects and compensates for noise (and ISI) in the signal

using a combination of both a product of a first matrix and transmitted symbol and a

product of a second matrix and a previously transmitted symbol (Fig. 5 Col 17 lines23-

65). It would have been obvious to one of ordinary skill in the art at the time of this

application to implement the precoder's functionality with Chaffee's echo canceller to

produce an echo signal (in the frequency domain) for the advantage that the precoder

(and as such, the echo canceller) takes into account ISI and ICI (noise) and provides

reduced computational complexity.

As per claim 19, claim rejected for same reasons as rejection of claim 18.

Additionally, Dowling discloses that the input signal vector may be multiplied with a

vector (Col 9 lines 31-55).

11.   Claim 44 rejected under 35 U.S.C. 103(a) as being unpatentable over Chaffee et al.

(5117418) as applied to claim 35, and further in view of Dowling (6597745).

As per claim 44, Chaffee discloses an echo canceller used in a transceiver (method of

reducing an echo) (ABSTRACT). The device comprises electronic circuitry configured

to estimate echo signals in the frequency domain, convert the estimate to the time-

domain, then subtract the estimate in the time domain (Col 3 line 5 to Col 4 line 10).

However, Chaffee does not disclose that the echo signals are estimated with a

combination of both a product of a first matrix and transmitted symbol and a product of a

second matrix and a previously transmitted symbol.

Dowling teaches an adaptive precoder that enables a block oriented receiver to

recover a datastream in the presence of ISI and noise (ABSTRACT) that will reduce

computational complexity over previous implementations (Col 2 lines 40-55). He further

suggests that the precoder may be implemented in (merged with) an echo canceller (Col

22 lines 1-17). The precoder detects and compensates for noise (and ISI) in the signal

using a combination of both a product of a first matrix and transmitted symbol and a

product of a second matrix and a previously transmitted symbol (Fig. 5 Col 17 lines23-

65). It would have been obvious to one of ordinary skill in the art at the time of this

application to implement the precoder's functionality with Chaffee's echo canceller to

produce an echo signal (in the frequency domain) for the advantage that the precoder

(and as such, the echo canceller) takes into account ISI and ICI (noise) and provides

reduced computational complexity.

Applicant's amendment necessitated the new ground(s) of rejection presented in this

Office action. Accordingly, **THIS ACTION IS MADE FINAL.** See MPEP § 706.07(a).

Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE

MONTHS from the mailing date of this action. In the event a first reply is filed within TWO

MONTHS of the mailing date of this final action and the advisory action is not mailed until after

the end of the THREE-MONTH shortened statutory period, then the shortened statutory period

will expire on the date the advisory action is mailed, and any extension fee pursuant to 37

CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event,

however, will the statutory period for reply expire later than SIX MONTHS from the date of this

final action.

Any inquiry concerning this communication or earlier communications from the

examiner should be directed to Alexander Jamal whose telephone number is 703-305-3433. The

examiner can normally be reached on M-F 8AM-5PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's

supervisor, Curtis A Kuntz can be reached on 703-305-4708. The fax phone numbers for the

organization where this application or proceeding is assigned are 703-872-9306 for regular

communications and 703-872-9315 for After Final communications.

CURTIS KUNTZ
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2600

AJ
May 12, 2004